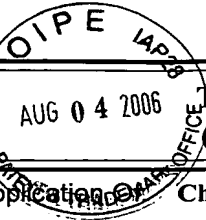


AUG 04 2006



**TRANSMITTAL LETTER**  
**(General - Patent Pending)**

Docket No.  
050726-US

In Re Application of Chen et al.

| Application No. | Filing Date      | Examiner | Customer No. | Group Art Unit | Confirmation No. |
|-----------------|------------------|----------|--------------|----------------|------------------|
| 10/568,230      | 11 February 2006 |          | 30234        |                |                  |

Title: Vertical Nano Transistor, Method of its Fabrication and Memory Assembly

COMMISSIONER FOR PATENTS:

Transmitted herewith is:

- a.) International Preliminary Report on Patentability (9 Pages);
- b.) Post Card Receipt

in the above identified application.

- ☒ No additional fee is required.
- ☐ A check in the amount of \_\_\_\_\_ is attached.
- ☐ The Director is hereby authorized to charge and credit Deposit Account No. \_\_\_\_\_ as described below.
  - ☐ Charge the amount of \_\_\_\_\_
  - ☐ Credit any overpayment.
  - ☐ Charge any additional fee required.
- ☐ Payment by credit card. Form PTO-2038 is attached.

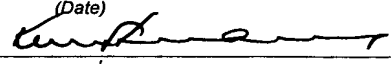
**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

  
\_\_\_\_\_  
Signature

Dated: 31 July 2006

Karl Hormann  
Registration No.: 26,470  
Area Code: 617.491.8867

cc:

|   |
|---|
| I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to the "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)] on<br>31 July 2006<br>(Date)<br><br>Signature of Person Mailing Correspondence<br>Karl Hormann<br>Typed or Printed Name of Person Mailing Correspondence |
|---|

PCT/DE2004/001838  
Eugene 19.07.06  
8.**PCT**

NOTIFICATION OF TRANSMITTAL  
OF COPIES OF TRANSLATION  
OF THE INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY  
(CHAPTER I OR CHAPTER II  
OF THE PATENT COOPERATION TREATY)  
(PCT Rules 44bis.3(c) and 72.2)

To:

GEMEINSAMER PATENTSERVICE  
Hausvogteiplatz 5-7  
10117 Berlin  
ALLEMAGNE

|   |   |
|---|---|
| Date of mailing (day/month/year)<br>13 July 2006 (13.07.2006) |   |
| Applicant's or agent's file reference<br>HMI2003/0202         | <b>IMPORTANT NOTIFICATION</b>   |
| International application No.<br>PCT/DE2004/001838            | International filing date (day/month/year)<br>16 August 2004 (16.08.2004) |
| Applicant<br>HAHN-MEITNER-INSTITUT BERLIN GMBH et al          |   |

## 1. Transmittal of the translation to the applicant.



The International Bureau transmits herewith a copy of the English translation of the international preliminary report on patentability (Chapter I).



The International Bureau transmits herewith a copy of the English translation of the international preliminary report on patentability (Chapter II).

## 2. Transmittal of the copy of the translation to the designated or elected Offices.

The International Bureau notifies the applicant that copies of that translation have been transmitted to the following designated or elected Offices requiring such translation:

None

The following designated or elected Offices, having waived the requirement for such a transmittal at this time, will receive copies of that translation from the International Bureau only upon their request:

AE, AG, AL, AM, AP, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DK, DM, DZ, EA, EC, EE, EG, EP, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OA, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW

## 3. Reminder regarding translation into (one of) the official language(s) of the elected Office(s).

The applicant is reminded that, where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability (Chapter II).

It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned within the applicable time limit (Rule 74.1). See Volume II of the PCT Applicant's Guide for further details.

|   |                                       |
|---|---------------------------------------|
| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland | Authorized officer<br><br>Ellen Moyse |
| Facsimile No. +41 22 338 82 70  | Facsimile No. +41 22 338 82 70        |

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

|  |  |  |
|--|--|--|
| Applicant's or agent's file reference<br>HMI2003/0502  | FOR FURTHER ACTION   | See item 4 below   |
| International application No.<br>PCT/DE2004/001838   | International filing date ( <i>day/month/year</i> )<br>16 August 2004 (16.08.2004) | Priority date ( <i>day/month/year</i> )<br>21 August 2003 (21.08.2003) |
| International Patent Classification (8th edition unless older edition indicated)<br>See relevant information in Form PCT/ISA/237 |  |  |
| Applicant<br>HAHN-MEITNER-INSTITUT BERLIN GMBH   |  |  |

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

- |  |   |
|--|---|
| <input checked="" type="checkbox"/> Box No. I  | Basis of the report   |
| <input checked="" type="checkbox"/> Box No. II | Priority  |
| <input type="checkbox"/> Box No. III           | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/> Box No. IV            | Lack of unity of invention  |
| <input checked="" type="checkbox"/> Box No. V  | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> Box No. VI            | Certain documents cited   |
| <input type="checkbox"/> Box No. VII           | Certain defects in the international application  |
| <input type="checkbox"/> Box No. VIII          | Certain observations on the international application   |

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis*.2).

|   |  |
|---|--|
| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland<br>Facsimile No. +41 22 338 82 70 | Date of issuance of this report<br>03 July 2006 (03.07.2006) |
|   | Authorized officer<br>Ellen Moyse<br>e-mail: pt05@wipo.int   |

# PATENT COOPERATION TREATY

Translation

From the  
INTERNATIONAL SEARCHING AUTHORITY

## PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:

Date of mailing  
(day/month/year)

Applicant's or agent's file reference

**HMI2003/0502**

**FOR FURTHER ACTION**

See paragraph 2 below

International application No.

**PCT/DE2004/001838**

International filing date (day/month/year)

**16.08.2004**

Priority date (day/month/year)

**21.08.2003**

International Patent Classification (IPC) or both national classification and IPC

Applicant

**HAHN-MEITNER-INSTITUT BERLIN GMBH**

1. This opinion contains indications relating to the following items:

- |                                     |              |  |
|-------------------------------------|--------------|--|
| <input checked="" type="checkbox"/> | Box No. I    | Basis of the opinion   |
| <input checked="" type="checkbox"/> | Box No. II   | Priority   |
| <input type="checkbox"/>            | Box No. III  | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability   |
| <input type="checkbox"/>            | Box No. IV   | Lack of unity of invention   |
| <input checked="" type="checkbox"/> | Box No. V    | Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/>            | Box No. VI   | Certain documents cited  |
| <input type="checkbox"/>            | Box No. VII  | Certain defects in the international application   |
| <input type="checkbox"/>            | Box No. VIII | Certain observations on the international application  |

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/EP

Authorized officer

Facsimile No.

Telephone No.

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/DE2004/001838

Box No. I

Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐

This opinion has been established on the basis of a translation from the original language into the following language

\_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (under Rule 12.3 and 23.1(b)).

2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

☐

a sequence listing

☐

table(s) related to the sequence listing

b. format of material

☐

in written format

☐

in computer readable form

c. time of filing/furnishing

☐

contained in the international application as filed.

☐

filed together with the international application in computer readable form.

☐

furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/DE2004/001838

Box No. II

Priority

1. ☒ The following document has not yet been furnished:

☒ copy of the earlier application whose priority has been claimed (Rule 43bis.1 and 66.7(a)).

☐ translation of the earlier application whose priority has been claimed (Rule 43bis.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date in the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43bis.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/DE2004/001838

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability:  
citations and explanations supporting such statement

1. Statement

|                               |        |                                     |     |
|-------------------------------|--------|-------------------------------------|-----|
| Novelty (N)                   | Claims | 3, 5, 10, 13, 15-17, 20, 21         | YES |
|                               | Claims | 1-2, 4, 6-9, 11, 12, 14, 18, 19, 22 | NO  |
| Inventive step (IS)           | Claims |                                     | YES |
|                               | Claims | 1-22                                | NO  |
| Industrial applicability (IA) | Claims | 1-22                                | YES |
|                               | Claims |                                     | NO  |

2. Citations and explanations:

Reference is made to the following documents:

- D1:** DE 101 42 913 A (HAHN MEITNER INST BERLIN GMBH) 27 March 2003 (2003-03-27)
- D2:** US-B-6 426 2591 (YU BIN) 30 July 2002 (2002-07-30)
- D3:** US-A-5 612 563 (FITCH JON T *ET AL*) 18 March 1997 (1997-03-18)
- D4:** MAEDA S *ET AL*: "A VERTICAL-SHAPE TRANSISTOR (V T) CELL FOR 1GBIT DRAM AND BEYOND" SYMPOSIUM ON VLSI TECHNOLOGY. DIGEST OF TECHNICAL PAPERS. HONOLULU, JUNE 7-9, 1994, NEW YORK, IEEE, US, vol. SYMP. 14, 7 June 1994 (1994-06-07), pages 133-134, XP000498617 ISBN: 0-7803-1992-2

1. Independent claims

1.1 Novelty

The present application does not meet the requirements of **PCT Article 33(1)** because the subject matter of **claims 1 and 11** is **not novel** within the meaning of **PCT Article**

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/DE2004/001838

Box No. V

Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

33(2).

1.1.1 Document D1 (the entire document) discloses (the references between parentheses relate to said document):

a vertical nanotransistor  
comprising a source region (4, 8),  
a drain region (7, 8),  
comprising a gate region (2) and  
comprising a semiconducting channel region (8) between  
the source region and the drain region,  
the gate region being formed by a metal film (2) into  
which the transistor is embedded in such a way that the  
gate region and the semiconducting channel region form a  
coaxial structure and the source region, the  
semiconductor channel region and the drain region are  
arranged in the vertical direction, and  
the gate region has an electrical insulation (1, 3, 5)  
with respect to the source region, with respect to the  
drain region and with respect to the semiconducting  
channel region, **which is relevant to claim 1.**

1.1.2 Document D1 (the entire document) furthermore  
discloses:

a method for producing vertical nanotransistors,  
comprising at least the method steps of

- producing holes (4) in a thin metal film (2) - forming  
the gate region of the transistor - for the purpose of  
forming the channel region (8),
- introducing insulator material onto the walls of the



WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/DE2004/001838

Box No. V

Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

holes,

- applying insulator material (1, 3) to the top side and underside of the metal film,
- introducing semiconducting material into the insulated holes for the purpose of forming the semiconducting channel region,
- applying contacts for forming the source region (6, 8) and drain region (7, 8), **which is relevant to claim 11.**

**1.1.3 Claim 1** is likewise **not novel** over the disclosure of documents **D2** (column 3, line 46 - column 6, line 18; figures) and **D3** (column 3, line 48 - column 7, line 60; figures 1-4).

## **2. Dependent claims**

**2.1** Dependent **claims 2-10 and 12-22** do not contain any features which, in combination with the features of any claim to which they refer, meet the PCT requirements for novelty and inventive step, for the following reasons:

The features of **claims 2, 4, 6-9, 12, 14, 18, 19 and 22** are already disclosed in document **D1**.

The features of **claims 3, 5, 13, 15-17, 20 and 21** are only in each case one of several obvious possibilities from which a person skilled in the art would choose according to the circumstances in order to solve the problem of interest, without thereby being inventive.

The features of **claim 10** have already been used for the same purpose in a similar transistor arrangement, in this

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/DE2004/001838

Box No. V

Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

respect cf. document **D4**. If a person skilled in the art wished to achieve the same aim in a transistor arrangement as per document **D1**, he could easily apply these features to like effect to the subject matter of **D1**. In this way he would arrive at a transistor arrangement as per **claim 10** without thereby being inventive.

**3. Concluding remarks**

It is noted that on the basis of the current application **it appears to be impossible to distinguish the invention from the prior art without contravening PCT Article 19(2)**. If the applicant nevertheless wishes to file new claims, then care must be taken to ensure that **no facts are introduced which go beyond the disclosure of the international application on the filing date**.